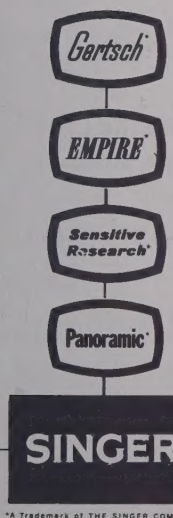
INSTRUCTION MANUAL

*Sensitive Research**

ALTERNATING CURRENT

INSTRUMENTS



*A Trademark of THE SINGER COMPANY

Precision electrical and electronic instruments for measurement

THE SINGER COMPANY • METRICS DIVISION

OPERATIONAL AND MAINTENANCE PROCEDURE

for

ALTERNATING CURRENT INSTRUMENTS

INITIAL INSPECTION

Upon receipt, your instrument should be carefully unpacked and examined for any visible external damage, i.e., split case, cracked glass, broken binding posts, etc. Place the instrument on a reasonably level bench. Turning the mechanical zero adjuster, move the pointer both above and below the zero line of the scale. It should have sufficient travel to go a little beyond zero in each direction. Set the pointer exactly on zero while lightly tapping the instrument case with your fingers. The pointer will be correctly adjusted for zero when no reflection of the pointer's knife edge can be seen in the anti-parallax mirror, and the pointer is directly over and in line with the scale zero.

TEST FOR BALANCE

Balance requirements differ for our various types of instruments. The general testing procedure for balance on all models is the same, the difference being only in the degree of angle that the instrument is tipped from a horizontal position.

1. Set the pointer exactly on its zero position.

2. Now tip the instrument slowly from the side farthest from you to an angular position as shown on the table below.

3. Next, lay the instrument flat again and then tip it on its left side and tap gently.

In both of these procedures the instrument should be within its balance specifications. In general, these specifications are as follows:

To the user of SINGER Instrumentation:

SINGER instruments are fabricated and tested under conditions of rigid manufacturing and quality control according to the best practice of the current state of the art. In addition, our Service and Applications Sections are available to you at any time.

The registration of your instruments and any comments will be most appreciated. The information concerning fields of application will aid us in providing you with pertinent literature from time to time.

REGISTRATION CARD

THE SINGER COMPANY
METRICS DIVISION

Name.....

Address.....

Models:..... Serial No. .....

....

Date..... CONDITION ON ARRIVAL.....

FIELDS OF APPLICATION: .....

SEND APPLICATION DATA TO: .....

.....

COMMENTS: .....

.....

.....

.....

Name & Title

PLACE
STAMP
HERE

THE SINGER COMPANY
METRICS DIVISION
915 Pembroke Street
Bridgeport 8, Conn.

ALTERNATING CURRENT INSTRUMENTS

Model	Accuracy	Angle from Horizontal	Balance Guarantee
A (Thermal) RF - XT (Thermal) AU - AUX (Thermal) JWTC (Thermal) University (Thermal)	.5%-1%	15°	.5 of 1%
MI - NSI - University (Moving Iron)	.5 of 1%	15°	.5 of 1%
FLV - DLW - VAW - PDLW	.5 of 1%	15°	.5 of 1%
PDW - D - DW - DYP	.25 of 1%	15°	.25 of 1%
L - DYL	.1 of 1%	10°	.1 of 1%
ESH-ESD	1%	15°	1%
ESD	1.5 of 1%	15°	1.5 of 1%
THACH (Self-Checking)	.2 of 1%	10°	.2 of 1%

FRICTION TEST

The instrument may be tested for friction by connecting it to a suitable source of power and deflecting it at least 25% of full scale, slowly reducing the deflecting current to zero. No instrument should be accepted for use if the pointer does not return within .1 of a division from zero. Be sure that your controls operate smoothly so that there will be no false indication of the pointer's sticking.

CARE AND MAINTENANCE

Caution - Disassembly of the movement should not be attempted unless a skilled instrument man and calibration and scale drawing equipment are available.

Good practice dictates that periodic checks be made for pivot friction, balance, and scale calibration.

If the instrument glass is cleaned, the task should be completed by heavily breathing upon it to dissipate any electrostatic charges that may have been generated by friction. Occasionally, the binding post's metal contact surfaces should be cleaned and brightened by the careful use of a fine sandpaper.

The instrument case may be cleaned by using carbon tetrachloride to dissolve any greasy surface accumulation. A brisk rubbing with a soft flannel cloth will restore moulded cases to their original lustre. Should the engraving "white" become discolored, it can be removed with a sharp point and refilled with a white wax crayon material.

OPERATIONAL PROCEDURE

1. Place the instrument on a level surface so that it is no more than 5° from the horizontal.

2. In good instrument practice, the instrument should be kept away from any source of very strong magnetic fields. Maximum tolerable field is 5 oersteds.

3. Set the pointer on zero.

4. For safety, it is best to turn off the current or voltage to be measured before making connections to any instrument.

5. Apply power and read the deflection when the instrument pointer comes to rest.

CALIBRATION CHECK

No actual calibration check should be made until the instrument has become thoroughly temperature saturated at the standard temperature (25°C) for at least four hours.

1. The deflection of the instrument is proportional to the RMS value of the applied voltage. Within its frequency range it is unaffected by wave form distortion.

2. To check on AC, apply voltage or current at the input terminals and read the instrument deflection directly. To check on DC, install a low resistance reversing switch in the circuit and take the average of reading with each polarity. (The average of two DC readings must be taken to obtain a "true reading".)

NON-LINEAR SCALE INSTRUMENTS

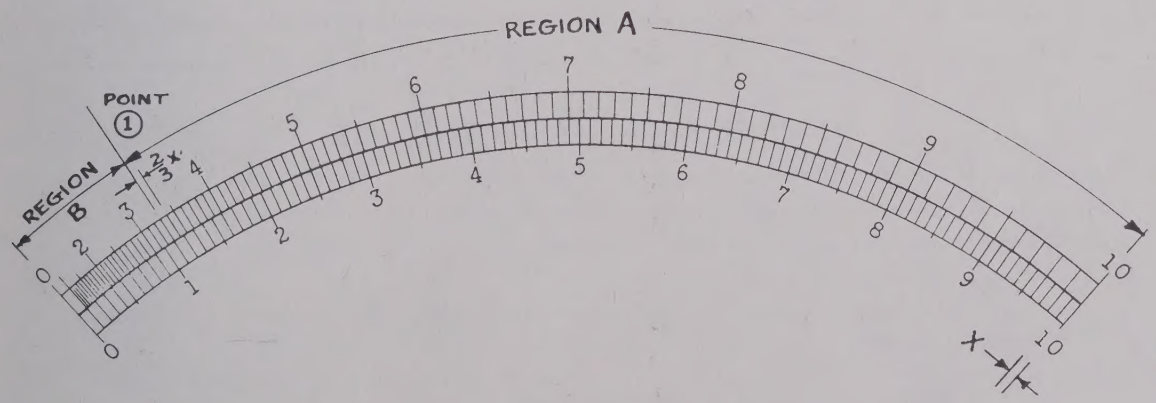
For non-linear scale instruments, such as thermal instruments, dynamometer instruments and similar types, the percent of full scale definition of accuracy has to be modified. The American Standard Association specification is stated this way. (See page 4)

"THE STATED ACCURACY ONLY APPLIES IN THOSE PORTIONS OF THE SCALE WHERE THE DIVISIONS ARE EQUAL TO OR GREATER THAN TWO-THIRDS THE WIDTH THEY WOULD BE IF THE SCALE WERE EVENLY DIVIDED. IN OTHER PORTIONS OF THE SCALE, THE ALLOWABLE LIMIT OF ERROR WILL BE A DISTANCE EQUAL TO TWO-THIRDS THE TOTAL SCALE LENGTH MULTIPLIED BY THE RATED ACCURACY (EXPRESSED AS A DECIMAL)."

For non-linear scales, above and below this point they actually have two different definitions of accuracy. In the Region A above the point where the 2/3 size division occurred, the accuracy is a direct percentage of the full scale reading. Simplifying further, and assuming full scale equal to 10, for a 1/2% accuracy instrument, the accuracy at any point in Region A only, is ±1/2 of one division regardless of the size of that division.

When we consider Region B of the scale, they change the definition of accuracy to a fixed scale distance rather than having the accuracy related to the constantly changing divisions. In this Region (B) the accuracy is defined as an exact allowable mechanical deviation rather than a percent of a division. This allowable deviation is taken to be the same mechanical error as is allowed at point (1), regardless of how large this may be in terms of the electrical quantities involved.

In summary then, throughout Region A we are allowed a fixed percentage of the electrical full scale value being measured, while throughout Region B we have a fixed mechanical amount of error allowed regardless of the electrical quantities involved.



EXAMPLE: In the above illustration, in which are drawn two scales and assuming a 1/2% instrument, the division on the nonlinear scale which is 2/3 the size of one of the linear divisions, is at 33 divisions (3.3 reading). Thus on this scale the guaranteed accuracy would be 1/2% of the full scale value for readings from 3.3 to 10. From 3.3 down to zero, the accuracy is .005 x 6.3" x 2/3 = .02". That is, the pointer will be within .02 inch of the correct position rather than an exact percentage of the full scale value read (assuming a 6.3 inch scale length).

WARRANTY

THE SINGER COMPANY, METRICS DIVISION, warrants each new instrument to be free from defects in material and workmanship, effective after delivery to the original purchaser as follows:

*Commander** Instruments: Potentiometers, Bridges, Volt Ratio Boxes and Standard Resistors.....5 years

*Sensitive Research** Electrical Indicating Instruments.....2 years

Other Electrical and Electronic Measuring Instruments.....1 year

Repair or replacement (at our option) without charge (F.O.B. factory) will be effected when our examination satisfactorily indicates that defects are due to workmanship or materials. Electron tubes, semiconductors, batteries, fuzes, lamps, thermoelements, and *RatioTran** potentiometers are excluded from warranty coverage. Warranty returns must first be authorized by the factory.

If the instrument or any portion thereof, has been abused, misused, damaged by accident or negligence, or if any serial number or seal has been removed or altered, the warranty is void.

This warranty is in lieu of all other obligations or liabilities expressed or implied and The Singer Company neither assumes, nor authorizes any person to assume for them, any other liability in connection with sales of instruments manufactured by The Singer Company, Metrics Division.

THE SINGER COMPANY • METRICS DIVISION

915 PEMBROKE STREET, BRIDGEPORT, CONNECTICUT • 3211 S. LA CIENEGA BLVD., LOS ANGELES, CALIFORNIA

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REPAIR AND MAINTENANCE

Instruments should be returned only on prior written authorization from the Singer Representative or the factory(1). Warranty repair will be made upon written request. Please provide the following information in order to expedite our processing of your instrument:

1. Model or Type
2. Serial Number
3. Description of trouble(2)
4. Test instruments used
5. Approximate date instrument was placed in operation
6. Approximate number of hours of use
7. Has maintenance action been previously requested?
8. Other comments

Upon receipt of this information our Service Department will send you service data or shipping instructions. Upon receipt of shipping instructions forward the instrument to the factory prepaid. If requested, an estimate of charges will be made before work begins.

(1) Contact Metrics Division, Bridgeport, Connecticut for *Commander**, *Empire**, *Panoramic**, and *Sensitive Research** instruments. Contact Metrics Division, Los Angeles, California for *Gertsch** instruments.

(2) Include data on symptoms, measurements taken, suspected location of trouble, maintenance action taken, and any other relevant data.